Environmental and Social Management Plan (ESMP)
Circular Bhutan Innovations Project: Pioneering Sustainable Development with Recycled Plastics – Component 1. Polyester Wool Bhutan
- Clean Bhutan

Environmental and Social risks and impacts are strongly linked to location and scope of activities. This Environmental and Social Management plan is the project activities involved in establishment of polyester wool production unit. Although there were no construction within the project scope. The main objective is to purchase machinery and install in the existing plant space. During the production phase activities production of PET flakes and polyester the project will look at the environmental and social impacts.

Establishment and operation of polyester wool plant at Taba, Thimphu

Project information:

Project Title	Component 1. Polyester Wool Bhutan
Estimate cost	US $ 119,500.00
Start /completion date	1st July 2024 – 31st March 2025

Project location

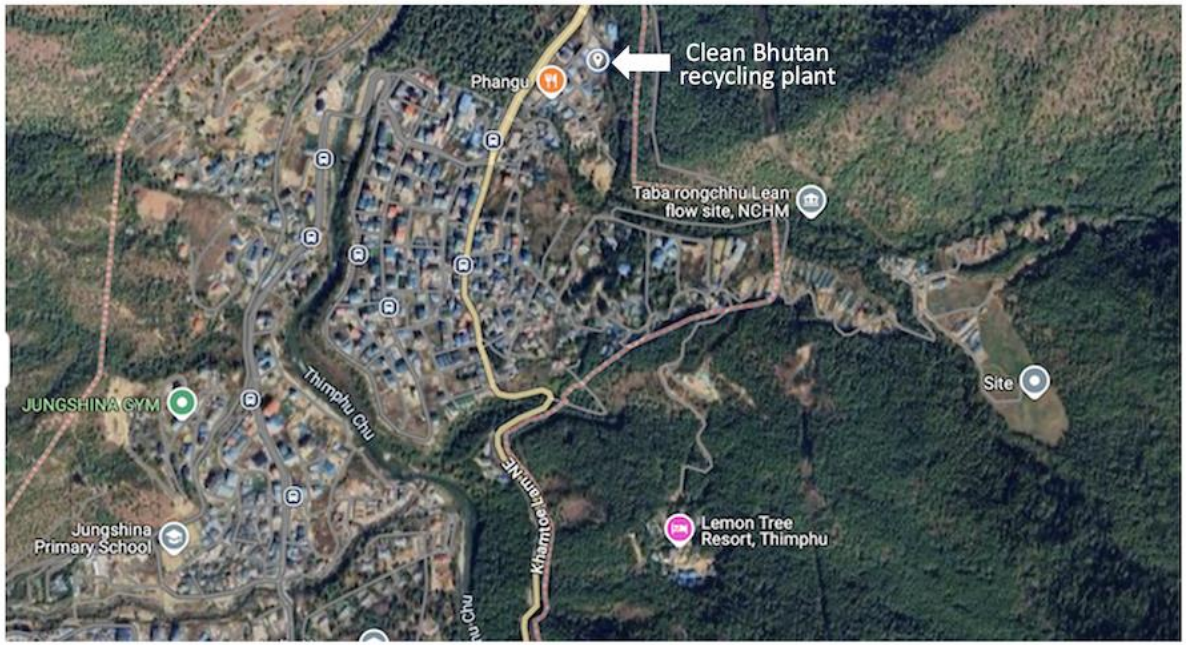
The Polyester Wool production center will be housed in the existing PET flake making unit at Taba operated by Clean Bhutan under the registered name within Thimphu city area. The location was provided by the Thimphu Thromde (Thimphu Municipality) office as part of waste management program. The flake making unit was established in 2022 as Public Private Partnership (PPP) model between local government and civil society organisation (CSO) a non-profit organisation to reduce plastic waste leakages into the local environment. Secondly, this model is established so that simialr programs can be replciated in other parts of the country thereby improving the social economy and reducing plastic pollution.

Under the PLEASE project this unit will be upgraded to producing polyester wool (PW) and increase the istalled capacity of flaking making unit. The proposed project component 1 i.e polyester wool, has provsion for purchasing one set of equipment to make flake

and convert into polyester wool. The existing plant has a constant supply of 33/11Kv power and the source is hydropower. Under the project, the existing plant unit will be fence for security purpose and also to provide exclusive boundary of the plant.

The plant is around similar altitude (2360 masl) to the southern zone of Thimphu Municipality, Babesa, and the rainfall patterns and seasons are also similar to Dechencholing and Motithang which is nearby Taba area. Entire Thimphu Dzongkhag (District) experiences dry months from December to March with rainfall a ow as 20 millimeters (0.79 inch) a month and as high as 220 millimeters (8.7 inches) in the monsoon months of July-September . Annual rainfall recordings on average can be nearly 650 mm (25.6 inches).

Location Source: Google map - (Location: Taba, Thimphu, the geographical coordinates for the location are 27.51714° North latitude and 89.64471° East longitude)



The project area is located at the periphery of Taba commuity and beyond the project area is forest cover where there are no inhabitants.

Project Activities

First of all, under this project component there is no construction actoivites except for erecting chainlink fence to secure the working area. Its main activity is to purchase a set of machinery to produce polyester wool and install it in the existing flake making unit. Secondly, the project has a small component to educate the local community and visiting student to learn more about circular economy on plastic waste.

Operational phase

a. Receiving raw materials: Under the project, segregated plastic waste will be collected from one or two bottling plantsand the nearby monastic body known as Dechenphug Lhakhang.

b. Sorting : The collected plastic waste will be transported to the recycling plant where it will be further sorted and segregated based on the type of plastic, namely PET , HDPE, LDPE and PP. The recycling plant will utilise the PET plastic waste only. The other waste like HDPE, LDPE and PP will be segrated and sold to Recycling Hub (RBG project) and Green Road (IG proejct) at Jemina. The PET plastic waste will be then used to produce the following two products i.e. PET flakes and polyester wool.

Production of PET flakes and Poleyster wool.

Following process is involved in the production of PET flakes:

i. Sorting: The PET bottles will be sorted according to the resin codefication. If required the washing will also be done to remove the dirt such as mud. The label and the bottle caps will be removed from the bottle. The label and bottle caps will be stored separately and then sold to Rcycling Hub and Green Road at Jemina.
ii. Shredding: The sorted PET bottles will then be shredded to two size of flakes before converting it into poleyseter wool. There are two types of machine. The first shreed machine will shred the PET bottles into 10 mm flakes. This 10 mm flakes are fed into the second shredding machine to convert into 3mm flakes. The flakes will be stored separately based on resin code.
iii. Conversion to wool: The specific resin coded flakes of 3mm size is then fed into the converter machine under specific controlled temperature specified by the quality assurance unit. The polyester wool is blown into the cooling GI wall.

iv. Packaging: The produced polyester wool will be collected and stored a safe and dry area before sending it to the distributors.

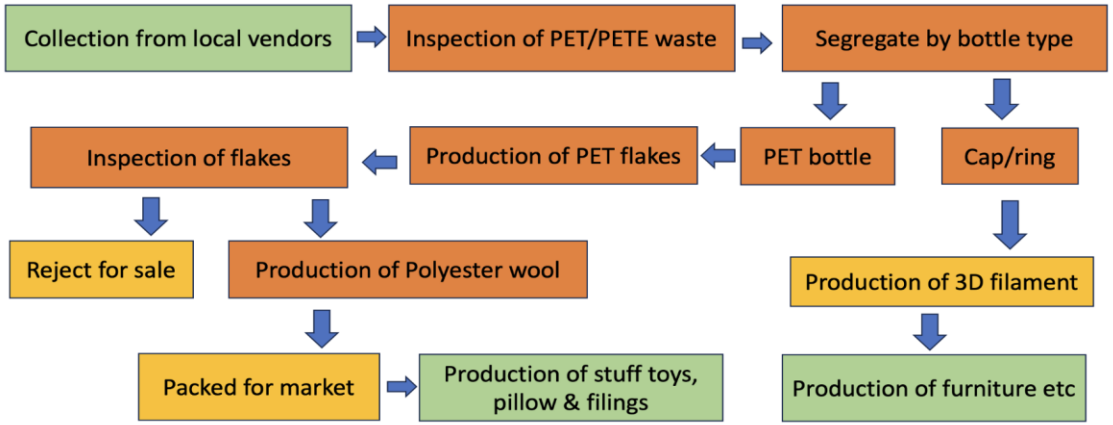
Training program for safety of the employees.

Capacity building for the recycling plant employees on Environment and Social safety to all recruits for an effective operation and management will include;

1. Training on use of PPEs and safeguards, first aid, emergency preparedness, fire drills, etc.,
2. Training on recognizing, preventing and responding to state of emergencies, risks to occupational health safety, social disgruntlement/complains from the community, workplace disharmony, etc.,
3. Awareness and understanding of gender based violence and discrimination (PSEA),
4. Training on machine operations and time to time updating the technological know-how capacities, especially whenever there is changes or updating of machineries, equipments and facilities; operational procedures, process steps to production, storing to marketing.
5. Training on workplace compounding, quality controls, housekeeping, ES protection andmonitoring and very importantly on waste management within the plant prior to disposal to the open environment.
6. Training on Initial Environment and Social Assessment (IESA) of the recycling plant and framing of Standard Operating Procedures (SOP) for monitoring and responses will be an added value and have sustainable impact not only in the ES impacts responses but also in maintaining the quality of the products.

Production flow chart – an overview

Flow Diagram – Polyester Wool Production



Risks & impact, mitigation, monitoring[1] during the operational phase

Antocopated E&S risks & impact	Risk mitigation & management measures	Impact mitiagtion		Impact/mitigation monitoring			Mitigation & monitoring cost
		Location/ timing/ frequency	Responsibility	Parameter to be monitored	Methodology including location & frequency	Responsibility	
There is likely to have some dust pollution during collection period	Enforce proper PPE to be used during the loading and unloading of PET waste	Loading and unloading of PET waste from store to the recycling plant	Transport and HR Supervisor	Types of PPE issued Identify type pollution Inspect Medical report	Site visit by Transport and HR Supervisor UNOPS specialist	Transport and HR Supervisor	US 200
Vapors from melting PET flakes to convert into wool may pose health risks from inhaling and skin contacts	Enforce proper PPE to be used during the production	During the wool production period only	Production Supervisor	Appropriate PPE issued Measure type of air pollution Medical report	Constant monitoring by Production manager UNOPS specialist	Production Manager	US 200
Dust pollution during the conversion of bottles to PET flakes	Enforce proper PPE to be used during the production	Flakes production period	Production Supervisor	Appropriate PPE issued Measure dust pollution Medical report	Constant monitoring by Production manager UNOPS specialist	Production Manager	US 300
During the heating process there is likely to have mild fume	Adequate ventilation, fans, will be ensured, Use of appropriate PPEs First Aid kit	Polyester wool prodtion period	Production Supervisor	Appropriate PPE issued Check adequate ventilation and fans	Constant monitoring by Production manager UNOPS specialist	Production manager	US $ 200

[1] Overall monitoring will be conducted by the UNOPS Environmental Specialist during the project period

	Fire Fighting facilities like fire extinguishers/fire hydrants will be installed			Adequate fire fighting equipment is isssued Adequate First aid kit issued			
Excessive noise and vibration from machinery leading to hearing loss, increased stress levels, and other health issues for workers.	use of PPEs such as earplugs or earmuffs Implementation of vibration control measures; fixing properly the machines onto the foundations, proper tightening of the joints and holders, setting up in chamber enclosure with appropriate mufflers for crushers. Noise level will be maintained at 75dB(A) at Day-time and 65dB(A) at night-time	Main noise is from compressor machine during the wool production time	Production Supervisor	The compressor machine should be remove to outside the plant Proper shed and insulation should be provided for the compressor Strict timing to be followed and avoid using the machine after 5 pm.	Constant monitoring by Production manager UNOPS specialist	Production Manager	US $ 500
Potential breakdowns and failures of machinery leading to operational disruptions, safety hazards, and delays.	Timely maintenance of machinery and keep records Perform routine inspections to identify and address	Inside the production plants	Production Manager	Timely maintenances records to be managed by the production team	Constant monitoring by Production manager UNOPS specialist	Production Manager	US 1000

	potential issues before they lead to breakdowns Ensure that all equipment is operated by trained personnel			Proper training to all personnel operating the machine			
Potential for community disruption and negative impacts on local quality of life due to project operations and activities.	Thimphu Thromde have been consulted on the project concept. Through such a process the Environment clearance was granted and location of the recycling plant allocated. A project's Grievance Redress Mechanism (GRM) will be established and details will be shared with the community	During operation period i.e. 9 am to 5 pm only	Production manager	To be operated only during day time Accept GRM and periodic meeting to be held with Thimphu Thromde	Production Manager UNOPS specialist	Production manager HR officer	US 500
Risk of emotional, physical, and social harm due to sexual exploitation, abuse (SEA), and sexual harassment (SH), potentially leading to a	A secure and confidential complaint box and worker grievance mechanism. Appointment of a designated point for both	During operational phase	HR Officer	PSEA training to be conducted	HR offcier	HR Officer	US 100

toxic work environment and long-term psychological effects on affected workers.	genders and an effective referral mechanism Provide regular training on preventing SEA and SH, ensuring a safe and respectful workplace.						